| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/746,487 | 12/22/2000 | Steven Tu | 42390.P8934 | 8961 |

| | | EXAMINER |
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| 7590 | 01/05/2004 | PATEL, ASHOKKUMAR B |

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

| | Application N . | Applicant(s) |
| **Office Action Summary** | 09/746,487 | TU ET AL. |
| | Examiner | Art Unit | |
| | Ashok B. Patel | 2127 | |

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**.        2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

## Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
    a)☐ All b)☐ Some * c)☐ None of:
      1.☐ Certified copies of the priority documents have been received.
      2.☐ Certified copies of the priority documents have been received in Application No. _____ .
      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
      application from the International Bureau (PCT Rule 17.2(a)).
    * See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application)
since a specific reference was included in the first sentence of the specification or in an Application Data Sheet.
37 CFR 1.78.
    a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific
reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

## Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

**1.** Application Number 09/746,487 was filed on 12/22/2000. Claims 1-30 are subject to examination.

### Claim Rejections - 35 USC § 103

**2.** The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

**3.** Claims 1-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Derrick et al. (hereinafter Derrick) (US 5,872,980) in view of Dao et al. (hereinafter Dao) (US 6,148,395).

**Referring to claims 1, 2, 3, 6 and 7,**

1. A article of manufacture including one or more machine-accessible medium having executable code stored thereon which, when executed by a machine, causes the machine to:

receive one or more semaphore modification requests from one or more requesting devices;

identify an ownership state of a semaphore corresponding to the one or more semaphore modification requests;

arbitrate to identify a first modification request of the one or more semaphore modification requests, the first modification request from a first requesting device;

allow the first modification request to succeed if the identified ownership state corresponds to the first requesting device; and

allow the first modification request to succeed if the identified ownership state corresponds to no ownership.

2. The article of manufacture recited in Claim 1 which, when executed by a machine, further causes the machine to:

decline a second modification request of the one or more semaphore modification requests.

3. The article of manufacture recited in Claim 1 which, when executed by a machine, further causes the machine to:

receive a semaphore read requests from one of the one or more requesting devices;

transmit the identified ownership state in response to the semaphore read request; and

allow the first requesting device to access a shared resource.

6. The article of manufacture recited in Claim 1 wherein arbitration is resolved on a round-robin basis.

7. The article of manufacture recited in Claim 1 wherein arbitration is resolved on a priority basis.

Derrick teaches the spin buffer where the lock and identification data within the semaphore is cached in a multiprocessor environment. (Abstract). Spin buffer thus provides the information within the semaphore relating to the ownership status of the shared resource. (col.3, lines 3-5). When the devices (fig.5, Bus Masters, 406A, 406B, 406C, and 406D) need access to a shared resource and after they initiate the read for the ownership (requests for semaphore modification), spin buffer detects (receives) the read for ownership from the devices. Spin buffer then identifies the ownership state of a semaphore corresponding to the requests (col. 5, lines 34-39). If the semaphore is owned by another device , the requesting device is denied access to the shared resource (declining second modification request). If the requested semaphore is not owned by another requesting device, then the requesting device can read the data from the semaphore which completes the process of acquiring the ownership of the shared resource ( transmitting the identified ownership state and allow the first requesting device to access a shared resource) (col.4, lines 3-9) . Bus controller along with Spin buffer also provides arbiter which determines whose and when to allow the request for resource ownership to succeed based on the priority and availability of a shared resource (Fig. 4, element 402 (Bus Controller), Fig.5, element 506 (Arbiter), col.4, lines 43-56). Although, the reference Derrick teaches that the first modification request is allowed to succeed if the identified ownership state corresponds to no ownership, and indicates that Bus controller (Arbiter) assigns a priority which determines which semaphore modification request is allowed, the reference fails to explicitly teach to

allow the first modification request to succeed if the identified ownership state corresponds to the first requesting device, however it is well known in the art to implement the desired protocol for the priority determining the order of granting the requests for semaphore modifications such as round robin. Therefore, it would have been obvious for one in ordinary skill in the art at the time the invention was made to design a means which causes machine to receive the requests for semaphore modifications, to identify an ownership state of a semaphores corresponding to semaphore modification requests, arbitrate and allow the modification requests to succeed as desired, in this case the first modification request to succeed if the identified ownership state corresponds to the first requesting device. Because, it is economical and efficient to share a resource among multiple processors rather than each processor is having a complete set of resources.

**Referring to claims 4 and 5,**

4. The article of manufacture recited in Claim 1 wherein the semaphore is stored in a multiprocessor comprising the one or more requesting devices.

5. The article of manufacture recited in Claim 4 wherein the multiprocessor comprising the one or more requesting devices is integrated on a single die.

Keeping in mind the teachings of Derrick as indicated above, Derrick does not teach storing the semaphore in a multiprocessor and multiprocessor comprising the

one or more requesting devices integrated on a single chip. Dao teaches the semaphore stored in a multiprocessor and the multiprocessor comprising the one or more requesting devices integrated on a single chip in the environment offering shared resources like floating point unit and cache. The multiprocessor also includes the logic control including arbitration for the use of certain shared resources and for updating status information regarding the current state of the device.(Abstract, Fig.1, col. 3, lines 34-43, col. 11, lines 20-25).  Therefore, it would have been obvious for one in ordinary skill in the art at the time the invention was made to integrate the spin buffer, arbiter, and semaphore memory of Derrick for storing the semaphore in a multiprocessor where multiprocessor comprises of one or more CPUs (requesting devices) on a single die as taught by Dao. Because, as inferred by the teaching of Dao, when requesting devices are integrated on a single chip, the chip size is reduced which translates into high manufacturing yield and low per-chip manufacturing cost.

**Referring to claims 8, 9,10, 12 and 13,**

8. A method comprising:

receiving one or more semaphore modification requests from one or more requesting devices;

identifying an ownership state of a semaphore corresponding to the one or more semaphore modification requests;

arbitrating to identify a first modification request of the one or more

semaphore modification requests, the first modification request from a first

requesting device;

allowing the first modification request to succeed if the identified ownership

state corresponds to the first requesting device; and

allowing the first modification request to succeed if the identified ownership

state corresponds to no ownership

9. The method recited in Claim 8 further comprising declining a second modification

request of the one or more semaphore modification requests.

10.The method recited in Claim 8 further comprising:

receiving a semaphore read requests from one of the one or more

requesting devices;

transmitting the identified ownership state in response to the semaphore

read request; and

allowing the first requesting device to access a shared resource.

12. The method recited in Claim 8 wherein arbitration is resolved on a round robin

basis.

13. The method recited in Claim 8 wherein arbitration is resolved on a priority basis.


Claims 8, 9, 10, 12 and 13 are the methods associated with the article of

manufacture of claims 1,2,3,6 and 7.  Therefore claims 8, 9, 10, 12 and 13 are

rejected for the reasons set forth in above paragraph for claims 1, 2, 3, 6 and 7.

**Referring to claim 11,**

11. The method recited in Claim 8 wherein each of the one or more semaphore modification requests received identify a corresponding requesting device of the one or more requesting devices.

Derrick teaches having a separate identification of each requesting devices connected to each port of spin buffer thus Derrick's spin buffer is capable of discriminating between the individual devices when it comes to prioritizing the semaphore modification requests. (col.5, lines 53-67 and col.6, lines 1-9).

**Referring to claims 14 and 15,**

14. A multiprocessor system comprising:

means for receiving one or more semaphore modification requests from one or more requesting devices;

means for identifying an ownership state of a semaphore corresponding to the one or more semaphore modification requests;

means for arbitrating .to identify a first modification request of the one or more semaphore modification requests, the first modification request from a first requesting device;

means for granting the first modification request if the identified ownership state corresponds to the first requesting device; and

means for granting the first modification request if the identified ownership

state corresponds to no owner.

15. The multiprocessor system recited in Claim 14 further comprising:

means for receiving a semaphore read requests from one of the one or

more requesting devices;

means for transmitting the identified ownership state in response to the

semaphore read request; and

means for allowing the first requesting device to access a shared resource.


Claims 14 and 15  include a multiprocessor system that implement the methods of

claims 8 and 10 associated with the article of manufacture of claims 1 and 3.

Therefore claims 14 and 15 are rejected for the reasons set forth in above

paragraph for claims 1, 2, 3, 6 and 7.


**Referring to claim 16,**

16. The multiprocessor system recited in Claim 14 wherein the one or more

requesting devices are fabricated on a single die.


Claim 16 is rejected for the reasons set forth in above paragraph for claims 4 and 5.


**Referring to claim 17,18, 19, 22 and 23,**

17.A multiprocessor comprising:

a logical plurality of processors;

a resource scheduling device coupled to one or more of the logical plurality
of processors to provide access to a set of resources;

a shared resource of the set of resources having a semaphore;

a semaphore checker coupled to the resource scheduling device and to the
semaphore to:

receive one or more semaphore modification requests from the one or more
of the logical plurality of processors,

identify an ownership state of the semaphore,

arbitrate the one or more semaphore modification requests and identify a
first modification request from a first requesting processor of the one or more of the
logical plurality of processors,

allow the first modification request to succeed if the identified ownership
state corresponds to the first requesting processor; and

allow the first modification request to succeed if the identified ownership
state corresponds to no ownership.

18. The multiprocessor recited in Claim 17 wherein the semaphore checker is
further to:

decline a second modification request of the one or more semaphore
modification requests.

19. The multiprocessor recited in Claim 17 wherein the semaphore checker is
further to:

receive a semaphore read requests from one of the one or more of the logical plurality of processors;

transmit the identified ownership state in response to the semaphore read6 request; and

allow the first requesting processor to access a shared resource.

22. The multiprocessor recited in Claim 17 wherein arbitration is resolved on a round-robin basis.

23. The multiprocessor recited in Claim 17 wherein arbitration is resolved on a priority basis.


Derrick teaches the spin buffer where the lock and identification data within the semaphore is cached in a multiprocessor environment. (Abstract). An arbiter is resource scheduling device that is coupled to the logical plurality of processors (Fig.6, element 506). Semaphore memory holds the semaphore for the entire set of resources (Fig.6, element 504). Spin buffer is a semaphore checker ( Fig.6, element 502, spin buffer) that is coupled to arbiter which is a resource scheduling device and the semaphore (semaphore memory). Spin buffer thus provides the information within the semaphore relating to the ownership status of the shared resource. (col.3, lines 3-5). When the logical plurality of processors (fig.5, Bus Masters, 406A, 406B, 406C, and 406D) need access to a shared resource and after they initiate the read for the ownership (requests for semaphore modification), spin buffer detects (receives) the read for ownership from the devices. Spin buffer

then identifies the ownership state of a semaphore corresponding to the requests

(col. 5, lines 34-39). If the semaphore is owned by another device , the requesting

device is denied access to the shared resource (declining second modification

request). If the requested semaphore is not owned by another requesting device,

then the requesting  device can read the data from the semaphore, which

completes the process of acquiring the ownership of the shared resource (

transmitting the identified ownership state and allow the first requesting device to

access a shared resource) (col.4, lines 3-9) . Bus controller along with Spin buffer

also provides an arbiter which determines whose and when to allow the request for

resource ownership to succeed based on the priority and availability of a shared

resource (Fig. 4, element 402 (Bus Controller), Fig.5, element 506 (Arbiter), col.4,

lines 43-56).   Although, the reference Derrick teaches that the first modification

request is allowed to succeed if the identified ownership state corresponds to no

ownership, and indicates that Bus controller (Arbiter) assigns a priority which

determines which semaphore modification request is allowed, the reference fails to

explicitly teach to allow the first modification request to succeed if the identified

ownership state corresponds to the first requesting device, however it is well known

in the art to implement the desired protocol for the priority determining the order of

granting the requests for semaphore modifications such as round robin. Therefore,

it would have been obvious for one in ordinary skill in the art at the time the

invention was made to design a means which causes machine to receive the

requests for semaphore modifications, to identify an ownership state of a

semaphores corresponding to semaphore modification requests, arbitrate and allow the modification requests to succeed as desired, in this case the first modification request to succeed if the identified ownership state corresponds to the first requesting device. Because, it is economical and efficient to share a resource among multiple processors rather than each processor is having a complete set of resources.

**Referring to claim 20,**

20. The multiprocessor recited in Claim 17 wherein each of the one or more semaphore modification requests received identify a corresponding requesting processor of the one or more of the logical plurality of processors.

Derrick teaches having a separate identification of each requesting logical processor of the one or more of the logical plurality of processors connected to each port of spin buffer thus Derrick's spin buffer is capable of discriminating between the individual logical processors when it comes to prioritizing the semaphore modification requests. (col.5, lines 53-67 and col.6, lines 1-9).

**Referring to claim 21,**

21. The multiprocessor recited in Claim 17 wherein the multiprocessor is fabricated on a single die.

Claim 21 is rejected for the reasons set forth in above paragraph for claims 4 and 5.


**Referring to claim 24, 25, 26, 27 and 30,**

24. An apparatus comprising:

a register to access a shared resource of a set of resources;

a semaphore corresponding to the shared resource; and

a semaphore checker coupled to the semaphore to allow access to the shared resource through the register.

25. The apparatus of Claim 24 wherein the semaphore checker is further to:

receive one or more semaphore modification requests from one or more of a logical plurality of processing devices,

identify an ownership state of the semaphore,

arbitrate the one or more semaphore modification requests and identify a first modification request from a first requesting device of the one or more of the logical plurality of processing devices,

allow the first modification request to succeed if the identified ownership state corresponds to the first requesting device; and

allow the first modification request to succeed if the identified ownership state corresponds to no ownership.

26. The apparatus of Claim 25 wherein the semaphore checker is further to:

decline a second modification request of the one or more semaphore modification requests.

27. The apparatus of Claim 25 wherein the semaphore checker is further to:

receive a semaphore read requests from one of the one or more of the logical plurality of processors;

transmit the identified ownership state in response to the semaphore read request; and

allow the first requesting processor to access a shared resource.

30. The apparatus of Claim 25 wherein arbitration is resolved on a round-robin basis.

Derrick teaches the spin buffer where the lock and identification data within the semaphore is cached in a multiprocessor environment. (Abstract). Semaphore memory holds the semaphore for the entire set of resources (Fig.6, element 504). Spin buffer is a semaphore checker ( Fig.6, element 502, spin buffer) that is coupled to arbiter is a resource scheduling device and the semaphore ( Fig.6, element 504, semaphore memory). The arbiter is a resource scheduling device that is coupled to the logical plurality of processing devices (Fig.6, element 506). Spin buffer thus provides the information within the semaphore relating to the ownership status of the shared resource. (col.3, lines 3-5). When the logical plurality of processing devices (fig.5, Bus Masters, 406A, 406B, 406C, and 406D) need access to a shared resource and after they initiate the read for the ownership (requests for semaphore modification), spin buffer detects (receives) the read for ownership from the devices. Spin buffer then identifies the ownership state of a semaphore corresponding to the requests (col. 5, lines 34-39). If the semaphore is owned by

another device , the requesting device is denied access to the shared resource

(declining second modification request). If the requested semaphore is not owned

by another requesting device, then the requesting  device can read the data from

the semaphore, which completes the process of acquiring the ownership of the

shared resource ( transmitting the identified ownership state and allow the first

requesting device to access a shared resource) (col.4, lines 3-9) . Bus controller

along with Spin buffer also provides an arbiter which determines whose and when

to allow the request for resource ownership to succeed based on the priority and

availability of a shared resource (Fig. 4, element 402 (Bus Controller), Fig.5,

element 506 (Arbiter), col.4, lines 43-56). Although, the reference Derrick teaches

that the first modification request is allowed to succeed if the identified ownership

state corresponds to no ownership, and indicates that Bus controller (Arbiter)

assigns a priority which determines which semaphore modification request is

allowed, the reference fails to explicitly teach to allow the first modification request

to succeed if the identified ownership state corresponds to the first requesting

device, however it is well known in the art to implement the desired protocol for the

priority determining the order of granting the requests for semaphore modifications

such as round robin. Therefore, it would have been obvious for one in ordinary skill

in the art at the time the invention was made to design a means which causes

machine to receive the requests for semaphore modifications, to identify an

ownership state of a semaphores corresponding to semaphore modification

requests, arbitrate and allow the modification requests to succeed as desired, in

this case the first modification request to succeed if the identified ownership state

corresponds to the first requesting device.  Because, it is economical and efficient

to share a resource among multiple processors rather than each processing device

is having a complete set of resources.


**Referring to claim 28,**

28. The apparatus of Claim 25 wherein each of the one or more semaphore

modification requests received identify a corresponding requesting device of the

one or more of the logical plurality of processing devices.


Claim 28 is rejected for the reasons set forth in above paragraph for claim 20.


**Referring to claim 29,**

29.The apparatus of Claim 25 wherein the logical plurality of processing devices

are integrated on a single die.


Claim 29 is rejected for the reasons set forth in above paragraph for claims 4 and 5.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ashok B. Patel whose telephone number is (703) 305-2655. The examiner can normally be reached on 8:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John A Follansbee can be reached on (703) 305-8498. The fax phone number for the organization where this application or proceeding is assigned is (703) 746-7239.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

abp
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